

Frank w/Paul Castleman: 7/24/94

did the arpanet end up not doing at all what it was intended to do.

e-mail was thought of as cheating at the beginning?

so marginal as to be almost ridiculous, almost an abuse of the government's money?

people early on started to use a form of e-mail. but even when we were using it at the beginning, there wasn't a feeling of, this is what we're going to use it for....

was severo thought of as a successful employee and kahn thought of as a little flaky...

bob kahn completely understood the power of fiber optics. people were just eginning to think about satellite communication, and said this will dominate communications....

e-mail: on a single computer system, could leae mail.

ray tomlinson thought up how to do it over the arpanet...

people were already doing this in a single computer,

invented a set of rules for the hosts to comunicate with each other...

ray wrote e-mail program to communic. among tenex machines.

almost instantly, began using it for not just the tenexes....

here were these smart people working on something that seemed trivial because it was just sending messages back and forth.

in some ways, the technically interesting part is the communications part of it.

the average person on the internet doesn't have any idea what's going on.

castleman was a sophomore @ harvard, looking for a summer job. father was a doctor at mass general hospital...

jordan baruch was more dynamic than bolt, beranek or newman.

had started a project called the hopsital computer project.

was a \$1 million contract when arpanet finally surpassed it.

my father heard about this thing, and i interviewed...

did a little programming on pdp-1...

lick had a kind of a debugging idea, that you almost wrot ea debugging program, instead of debugging a step at the time....wrote a program to automate the process.

lick was more like a super intellectual off in another space.

only one paper tape reader...only one person could do it at a time.

would say it's busy ---> or <---- , which didn't expand very well to even four.

i came in 1961, which was just before hospital computer project...

back in '65, the first of the commercial spin-offs...

most of the time frank came up with technology and it would make money and said let'scommercialize it and would fail.

bbn's essentail nature is that it does advanced research into technology...

has failed virtually every time....

while selling packet networks like crazy....

FRANK never thought it was successful.

mostly made money on government sales. would hide the government and stories would be all about barclays and the airlines.

did a convertible bond...bbn managed to raise a lot of money by selling convertible debentures. steve has always been very good at raising money... raised a lot of money for aci...got \$30 mill. to go push it

his first success was selling off telcomp, a commercial timesharing services...

at least

frank represents the epitome of its essential nature...always the one in charge and put a lot of energy into operating the whole R&D. not some of the AI.

how so?
the largest activity was the network stuff.
the first way was to set up telnet....

like a gambler who wins the jackpot then gambles it again. put it all back in the jackpot...

began to try to sell commercial networks. ..
the attempt to build a commercial network.
p.c.: it only looked successful because incremental part of commercial business on top of government business. never a majority in any fiscal year. those were easy sales (to the govt)...
some sales would struggle for a year....

then advanced computer (off the pluribus)...
the arpanet needed a faster switch, but all the people involved in that (including kahn, who was running the arpa office)... bbn interested in building this machine, bbn realized a very good machine in its own right. the excuse was that we needed a faster switch....

when bbn then saw we had a multiprocessor, began to work on commercial sales of multiprocessors....
the sales were all government sales. it started off the same way: the real money came from govt. sales and commercial were not there, and the company failed.

then govt. got involved in simulation...
simulating a whole battalion of tanks fighting each other...
(simnet)....

software products co. for statistical package, taking data and collecting it, then decided to try to turn it into a commercial product...

when they got spun off, i didn't have control of them, but then did have control of some of them.

the telnet example is the best way to do it: sell it off at early stage for cheaper (or cheaper than it would have gotten otherwise)...

when p.c. got there, about 200 people there, mostly an acoustic company.
it tried to maintain itself as an acoustics co.
there were times when we had much more of the sales (computers) but acoustics...

it was an acoustics place, and by far the most imp. thing was consulting, it was the dominant theme. even when naval thing got to be larger...it stayed being a consulting firm...
hospital compr. project came to be largest project...

i was 24 at the time.

when we first met, frank made some technical distinction. they tried to gloss over something, and you said NO, it's really this and not this. it was intellectual energy in technical issues, but not down in the bits...it's the middle.... the most useful middle band...

"engineering is the art of the possible."

having an understanding of what's going on and what are the pieces. it's that broad broad band....

there was a lot of energy talking about it.

newman and bolt are more the gentleman professor and frank comes from a whole diff. place...

culturally very different...

acoustics bent, and a real connection to mit, and in ctr. section of bbn, a lot of back and forth with m.it. hackers.

a very close connection. in some ways the whole computer culture was really an outgrowth of mit.

at some point it turned from being a small computer co. (people brought their dogs...siberian huskie...played ping pong late at night...long before the image of the computer guy in the plaid shirt, very much like that: an academic)

some woman had a yippee little poodle: alice hartley...

when my dog turned one i invited other dogs and the masters came...

there were eight dogs there, my dog had eight friends at work...

it was like the idea: you can work all the time..

we're switching topics now...

the groups were pretty separate, and there wasn't a mutual respect for the other group... computer systems people thought they were somehow real.

the computer science people always thought they were a step above...

the other group might have felt resentment because they were treated like second-class citizens.

individuals got a long fine. it's excessive

there was a cultural difference, a huge one. when he tried to do his old culture in this new one he wasn't always appreciated.

the job of a leader is to provide the corporate culture. he didn't say you're an academic

we'll make it nice for you....

i had a job to do.

it was never personal. it was a professional, cultural difference.

there were a number of fascinating problems in the arpanet:

routing is a very interesting problem. it can go 5,000 ways. the question of how you route a packet and what algorithm do you use is just a fascinating technical problem. people have feeding frenzies over these things.

crowther had to get the program to work to do the routing. kahn was always running around behind him saying do it this way. one of them had the responsibility for actually implementing the lines of code.
crowther would invent some elegant...

bog would chew on things. he could have had a pipe. he was more a professor type. they were absolutely opposite, but their minds worked in very different ways...
bob was in a group that valued the crowthers. you feel personally not as loved and appreciated.

two or three technical problems....
not just kahn but people at ucla -- kleinrock --
and a lot of people had opinions about how to do it than the way we actually did it.
while we may be listened to some of them some of the time...

in a couple of cases they were correct.

of course we're gonna make mistakes, we're in this crash effort.

as a manager of the project, that was a really dull topic.

lots of egos. these are people who are very smart, think they're generally right. they are generally right. it's just not their style. in some ways it's a male thing, proving they're right.

kleinrock still to this day talks about how bbn screwed up the network cuz it locked up one day.

flow control: given host computer trying to send messages to another one and let's say it goes down and can't take it.
have many flows going all the time. poor imps have to deal with all this traffic. generalized problem of how to deal with flow control.
bbn's problem to design approaches to these things and implement them in the subnetwork.
some of the problems were solved by demanding the host solve them and others were solved by putting something into the imp.
had graduate students literally writing phd theses about these topics.

there were people all over the country and all over the world who did not believe the network would work. they based this on their experience, phone system, thought it was too hard a problem, you couldn't route stuff that way. a number of people who felt it couldn't work.

when you have a whole new area, very exciting, and it's all brand new, it happens very fast.

like in atomic bus., people trying to separate u235...in tk diff. ways...

Honeywell in an awkward position:

At any given time for a given applic., if looking for computer of choice for that year....often one machine that's the machine of choice. many teams concluded that ddp-516 was the right machine....

put honeywell in a very stressful position...

we were trying to design this thing as well as talk to them.

it was a very intense interaction with honeywell, not just going to the salesman and asking for the price list.

in a system like this, high performance in a little machine, details were critical. we had to understand them in great detail.

at the time we didn't know they were dealing with other groups. they were being very careful to not transmit info. between primes. they were trying to play it straight.

there was a tremendous amount of pressure. we were trying to do something in 9 months....unusual today, even with all the tools currently available. if someone claims they can build a new interface from a standing start in 9 months...

the gov't is in some ways a wonderful customer.

it's a self-insurer. if you're building a nuclear plant...

it pays its bills...

the gov't has a whole set of contract rules you don't have to negotiate each time. there's a whole bookshelf that tells you what the rules are.

often intsd. in cutting edge technology.

if good agency (like larry), they're smart, sophisticated.

cost-reimbursement....were paying cost plus some fee.

contractor works and gets paid for costs whether or not it gets done.

gov't often TRIES to buy things fixed price. wants to try to keep burden on contractor.

the whole commercial sales process is much more expensive.

gov't contracting is a mixed bag. lots of negatives. a small co. has lots of trouble doing gov't contracting.

CONTROL ISSUE:

no control, says frank, cuz each was autonomous...

and didn't control the content.

every single network has an operator....

what if he had maintained control?

not the exponential growth that it's had. it wouldn't have been possible. i could never have managed to make it....

the fact it grew this way is everyone all over the world wanted to it.

the internet:

by the mid-70's it had grown to 50 nodes, and many people were trying to understand how to get hosts to communicate.

the hosts, even though they can be connected perfectly....still may not be able to communicate if they don't talk the same language.

a whole activity to build protocols

people were building networks all over the world, and at the same time, in nwg, host organizations talking about how hosts should communicate.

like dropping crystals in a supersaturated solution.

bbn had contracts to work on the internet. we actually worked on devices between networks so they would work smoothly.
bbn ran the routers for a bit. it did begin growing like topseed (??)

that was a second big step. first networks, then networks of networks.

computers; timesharing; networks; networks of networks.

different people, smart people working to make it work.

the nwg was chaired by arpa. and they didn't take any guff. the fact that it started by having someone force compliance...

hosts had to have standards and rules for intercommunicating with one another.
nwg's were big meetings, and sometimes very argumentative meetings. if nwg produced a standard, every host had to spend money and resources...
money out of their contracts. money out of their universities. critical that arpa had control for both streams of money: to network builders and network users.

ibm had sna.

ibm for many years was trying to control the whole computer industry. they established rules, very complicated rules for connecting a different machine to an ibm machine.
ibm made it deliberately difficult cuz they didn't want anyone to buy dec machines.
for a while it was NOT easy to connect IBM machines to the networks. ibm made it hard

...

then ibm switched and realized they had to allow this intercommunication.

alohonet was the earliest example of attempting to share a radio channel. it was the precursor of ethernet. ethernet shares a wire.
norm abrahamson...had diff. branches of univ.on diff. islands.
worked on system where each shared one frequency, so every site could try to transmit, with algorithm in computers....

shared use of radio channel for data in a way that allowed all the sites to use one radio channel.

little computers tried to time share the channel. had to be adaptive.

various elaborations on aloha: larry made observation called slotted aloha that got more use of the channel.

bbn has built systems for sharing a satellite channel.

the notion of a shared use of a channel using computers to adaptively allocate the available bandwidth came first with alohanet.

just like packet switching: sharing a wire, a channel.

none of these things would have happened if the arpa network weren't around....

all got interconnected with the internet. alohanet didn't have anything to do with the internet particularly.

nep ----> tcp/ip
ASK ALEX.

the gov't was torn between letting tcp/ip take over and following ccitt's iso standards.

the gov't was in a bit of quandary, cuz dod was pushing tcp/ip while phone cos. wanted to intercommunicate with phone cos. overseas.

alex contributed by trying to get those two things closer, tried to move those two bodies of rules to be more compatible.

much later, when larry was at telnet, made an effort to get ccitt to adopt tcp/ip as an international standard. so the thing became another international standard.

what kind of manager: i've been a very good one....good at attracting wonderful people, and keeping them from leaving.

good at not minding having very very smart people working for me ... e.g. i could never program like crowther or design hardware like ornstein...

and i could stand a lot of kookiness. if a person was good enough i could stand a lot of silliness or foolishness or random behavior or psychotic behavior.

from PC:

frank's ability to attract good people.

and keeping them, esp. the kinds of people who aren't nec. corporate team players.

being able to handle very capable people who might be whacko.

a lot of managers wouldn't start by talking about how smart people are, might talk about key people.

number of neurons per cubic centimeter. density of intellect. intensity and ...

frank appreciates very smart people.

on counterside: many managers think of building a team, how do the team people think of working together.

he thinks put a lot of capable people together and they'll do something great.

frank thinks if you're smart you can do things in a certain area.

a tendency on my part to believe very smart people can diff. things.

frank is classically task-oriented, which has nothing to do with whether you like people or want people to be happy.

probably there's another area of a manager: a manager should instill spirit, energy and enthusiasm into the work. loving it all.

many people would also feel he's a worrier; it's why things get done, but the worrying part is less enthusiastic.

i'd come in with things i thought were great...

he doesn't stick to his opinion just because he's sticking to his position.

generally more problems on the way into the door than on the way out the door.

frank's superiors found him hard to deal with, would stick to his guns when he thought he was right, rather than deferential let's work this out...

i'd much rather work for frank than have him work for me.

he really cares for his people, as a human being all the way down.
which is why he's upset when people leave.

i put all kinds of energy into getting people not to leave. i've been incredibly successful at turning around people who were thinking of leaving.

engineering is an angle on life, and a manager as an angle on life is someone who focuses on getting the task done.

didn't put a lot of effort into organizational structure.

lots of managers look at their organizational chart.

at whirlwind and lincoln lab there were no levels of people. there were professionals who were staff people.

at bbn there are 20 levels...grades, you sit around in meetings and have arguments about who should be a 23...

frank has worried about who's working for whom, temporarily on projects...

frank had a linear scale: ranked people according to age and success.

the people he trusted would rank other people, and forced people to think about it.

i had a rule: if two people walked into your office and said they were going to quit, and you could only talk to one, who would you talk to?

P.C.:

bbn had gone from being proud it didn't have a corporate self-image, a somewhat non corporate, non self-conscious, unconventional attitude toward itself, to having a very conscious self-image: we wanna be like the big guys. it was looking forward to how do we be like the big guys: a billion-dollar co.

there was an image of what it was like to be a billion-dollar co., they had an image and they started to mold the place in that image. became much more of a corporate place.

weren't good at hiring or firing in the top management.

when you have a problem, reorganize....

they would decentralize, and recentralize.

it became a self-conscious management style.

levy was a financial person. he wasn't a manager.

on retirement:

i'm not having any second thoughts cuz it was clearly the right thing to do. (an engineering decision)

you tend not to be ...

finally you had been given your thing and once more it was taken away.

i told steve i'd give him 18 months. i might have stayed longer.

when hawley died...it hit close to home.

george saw where all the action was... i know who's in full control, i've got no confusion on this point.

frank always hated joint ventures....